

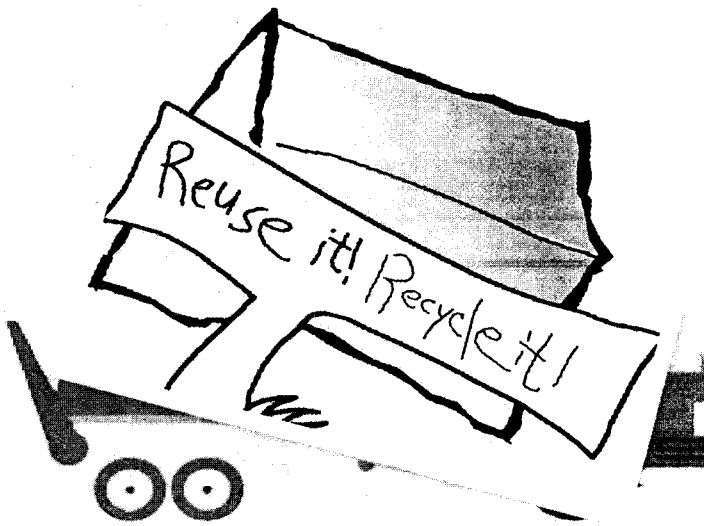
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**URBAN DEVELOPMENT & HOUSING
DEPARTMENT**

*Construction and Demolition
Waste (C & D Waste) Policy
document for State of Bihar*

GOVERNMENT OF BIHAR



2019

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1. Introduction

Development of infrastructural facilities is accompanied by construction, remodelling and demolition of buildings, roads, bridges, flyovers, subways, runways, factories and other similar establishments.

The waste generated by such activity mainly consists of inert and non-biodegradable materials such as concrete, plaster, wood, metal, broken tiles, bricks, masonry etc. This waste is generally found lying in heaps on road sides and is sometimes also found thrown in municipal bins mixed with Municipal Solid Waste. Waste from small generators like individual house construction or demolition usually finds its way into the nearby municipal bin, waste storage depots, making the municipal waste heavy and unsuitable for further treatment such as composting or energy recovery. Sometimes the wastes from small projects are buried in the site itself, forming an impervious layer, which adversely affects the growth of vegetation, prevents the infiltration of surface run off into the ground water table and leads to high levels of environmental imbalance. The debris and silt thus generated during construction and demolition activity flows through the surface runoff and chokes the drains resulting in water logging.

Current Scenario of C & D Waste Generation in India

It is estimated that the construction industry in India generates about 10-12 million tons of waste annually. Projections for building material requirement of the housing sector indicate a shortage of aggregates to the extent of about 55,000 million cum. An additional 750 million cum. aggregates will be required for achieving the targets of the road sector. Recycling of aggregate material from construction and demolition waste may reduce the demand-supply gap in both these sectors. While retrievable items such as bricks, wood, metal, tiles are recycled, the concrete and masonry waste, accounting for more than 50% of the waste from construction and demolition activities, are not being currently recycled in India. (CPHEEO, GoI).

The boom in the economic growth in the country is attributed to the developments in the construction industry. Investment in construction accounts for nearly 11 per cent of India's Gross Domestic Product (GDP). **The Technology, Information, Forecasting and Assessment Council (TIFAC) considers approximately 25% of all solid waste to be C&D Waste and by using this matrix the C & D waste Generation in Patna Municipal Corporation is 250 tonnes/day (based on TIFAC study conducted in 2001).**

Forecast estimates: Presently, C & D waste generation in India accounts up to 23.75 million tons annually and these figures are likely to double fold up to 2016. (Source: International Society of Waste Management, India).

Estimation of C & D Waste Generation in India

In research literature, various methods have been employed to quantify the C & D waste generation at both regional and project levels. Technology Information, Forecasting and Assessment Council's (TIFAC) has developed some estimations on C & D waste generation which recognizes that the generation is project specific, as follows:

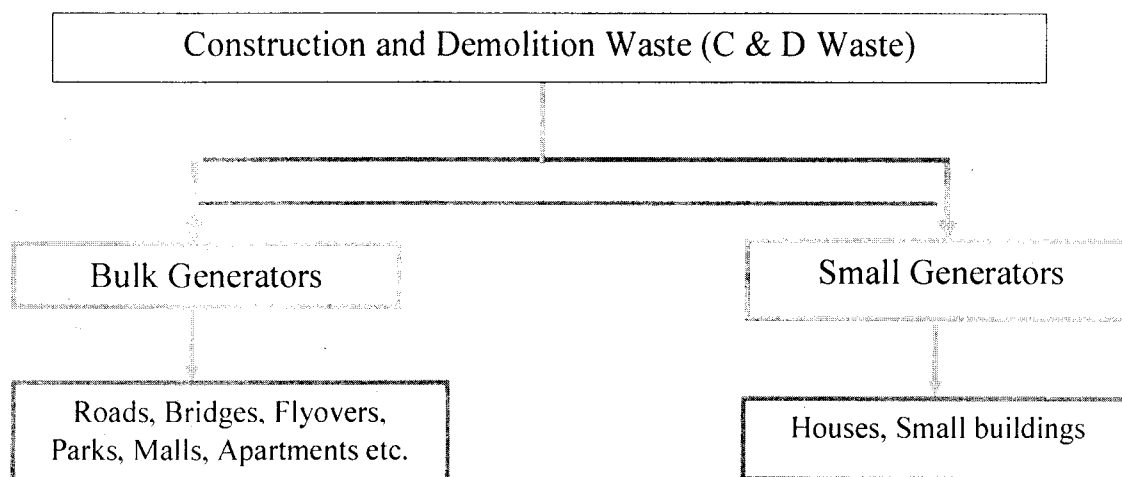
- a. Range 40-60 kg per sq.m of new construction,
- b. Range 40-50 kg per sq.m of building repair,
- c. Range 300-500 kg per sq.m for demolition of buildings.

From the above, it may be noted that the highest waste generation comes from demolition of buildings.

Sources of C & D Waste Generation

Construction and demolition waste is generated from construction, re-modelling, repair of civil structure and demolition activity of old buildings/structures. Indian cities are growing at a fast pace and the old

infrastructure is being remodelled or demolished to develop new infrastructure facility which generates a huge amount of Construction and Demolition Waste. The lack of proper management facility of this generated waste further increases the problem manifold and creates numerous environmental problems.



1.4. Composition of C & D Waste in India

The Construction and Demolition Waste Management Rules, 2016 defines C&D waste as the waste comprising of building materials, debris and rubble resulting from construction, re-modelling, repair and demolition of any civil structure. The composition of C & D waste varies depending upon the Project. C & D Waste can be broadly categorized as mixture of following materials:

Material	Composition
Soil, Sand & Gravel	36%
Brick & Masonry	31%
Concrete	23%
Metals	5%
Bitumen	2%
Wood	2%
Others	1%

Source: Technology Information, Forecasting and Assessment Council, Department of Science and Technology, Government of India, 2001

2. OBJECTIVES

Under Rule 9 (1) of the C&D Rules, the Secretary in-charge of Urban Development in the State Government is required to prepare the state policy document with respect to management of construction and demolition of waste in accordance with the provisions of C&D Rules. Pursuant to this provision, this policy document on C&D Waste is being prepared for the State of Bihar to sustainably manage the C&D Waste which is increasingly being generated. This policy is aimed at relevant

authorities, other functionaries of ULBs and other stakeholders to prepare the plan and procedures for management of C&D Waste within their jurisdictions.

The objectives of the Construction and Demolition Waste Management Policy document for Bihar State are:

- a) To ensure collection, storage and processing of C & D waste.
- b) To ensure that no C & D waste is dumped in the open.
- c) To ensure that all Urban Local Bodies effectively implement the C & D Waste Management Plan to avoid the environmental problems that arise due to open dumping of these wastes.
- d) To identify suitable lands for dumping of C & D waste and further processing through Private Operators/Agencies.
- e) To ensure involvement of different stakeholders in the successful implementation of C & D Waste Management Policy.

3. "3R" PRINCIPLE FOR MANAGEMENT OF C & D WASTE

The concept of "3R" principle has been proposed for reducing, reusing and also recycling wastes in the construction industry. The different processes involved in construction projects namely designing, production and manufacturing at the construction sites directly lead to waste creation, therefore it is essential for a green economy to follow the "3R" principle in the construction projects.

a) Reduce

Potential wastes can be identified early in the design process itself and measures should be taken during design stage to minimize the waste that may generate. Waste reduction can be achieved by designing with standard sizes for all building materials, planning for flexible spaces and ensuring that designs are adaptable to changing uses and are amenable for deconstruction and reconstruction.

b) Reuse

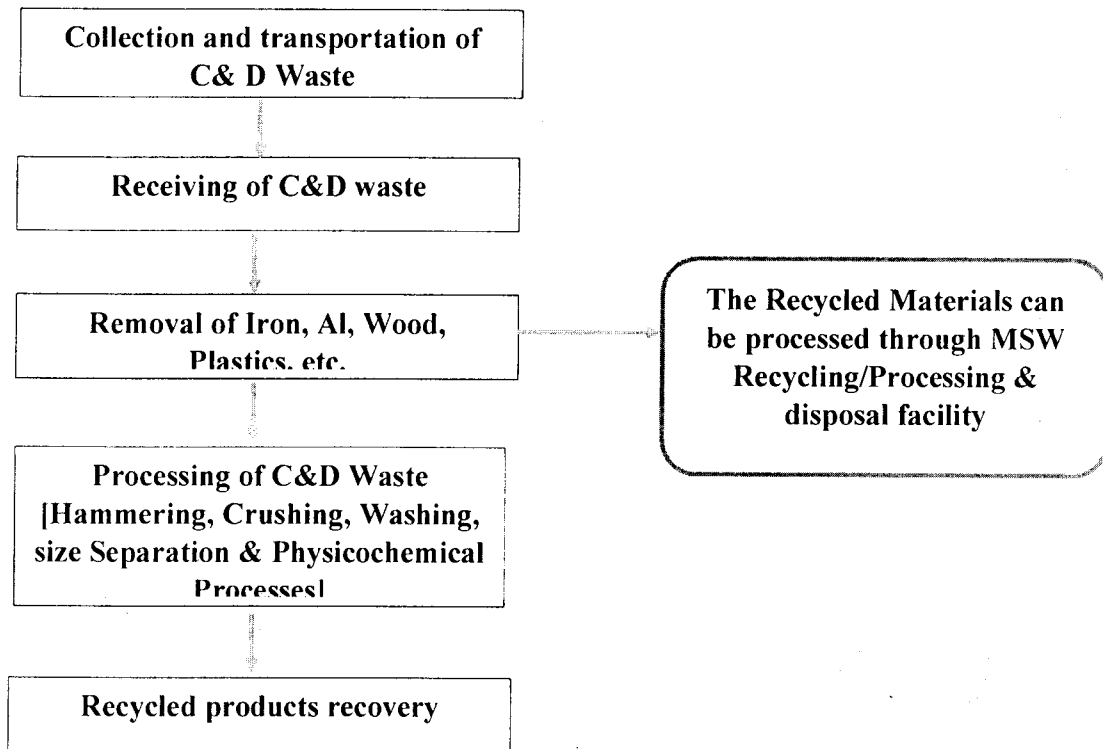
This involves identification of waste that can be salvaged for reuse on the current project or another project or that can be donated. A comparison of the value of the materials "as it is" for salvage and to their value as materials for recycling may be considered prior to reuse in many cases. Some of these materials may be valuable to reuse on-site; others may be sold to be used as building material in another site or donated to a charitable organization

c) Recycle

After exploring all the options to prevent waste and salvaging and reusing materials, the next step is to recycle as much of the remaining debris as possible. Recycling saves money by minimizing disposal costs.

4. C & D WASTE MANAGEMENT

The involvement of all stakeholders and adoption of suitable management practices is key to successfully achieving efficient C & D Waste Management. The management of C & D waste from flow to disposal can be illustrated as below:



5. STORAGE OF CONSTRUCTION AND DEMOLITION WASTE

C&D wastes are best stored at source, i.e., at the point of generation. If they are scattered around or thrown on the road, they not only cause obstruction to traffic but also create several problems like choking of drains, air and water pollution.

5.1. Role of Waste Generators

➤ As per C & D Waste Management Rule, 2016 every waste generator is responsible for collection, segregation and storage of C&D Waste they are generating. The generator is required to ensure that other waste (such as Municipal Solid Waste and Hazardous Waste) does not get mixed with the C&D Waste and that the C&D Waste is stored and disposed of separately. Every waste generator is mandated to keep the C&D Waste within the premises or get the waste deposited at the collection centre made available by the Urban Local Body or handed over it to the authorised processing facilities of C&D Waste and to ensure that there is no littering of such waste.

➤ Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar and shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodelling work and keep the concerned Urban Local Body informed regarding the relevant activities from the planning stage to the implementation stage and this shall be on project to project basis.

5.2. Role of Urban Local Bodies

➤ The Urban Local Bodies, in coordination with the concerned District Administration, shall identify suitable land for setting up of storage, processing and recycling facilities for Management of

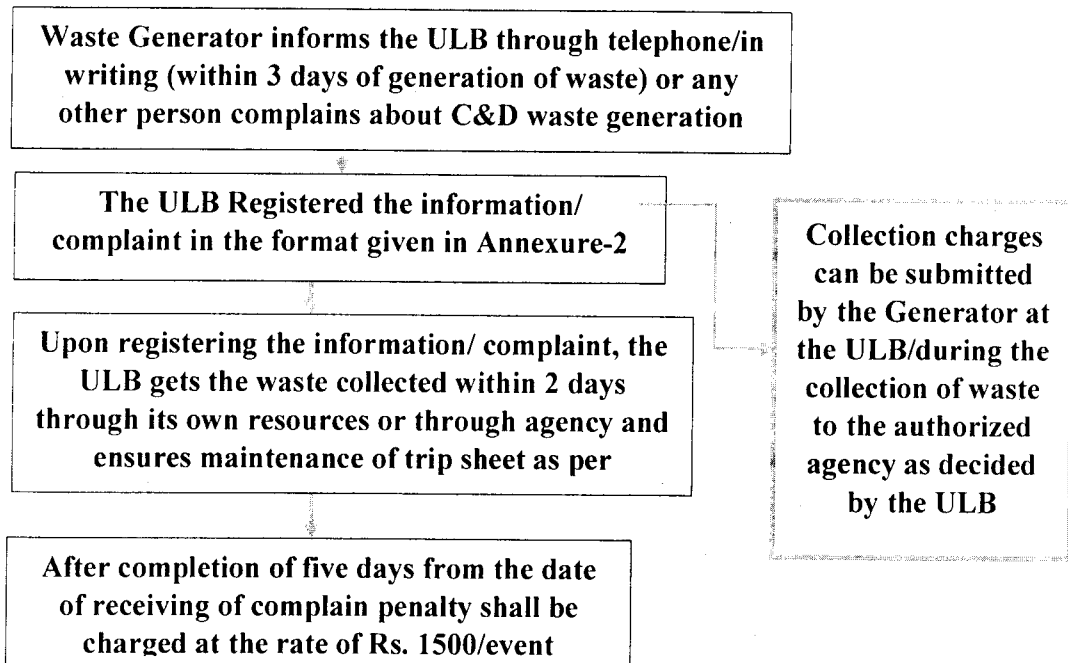
Construction and Demolition Waste. ULBs can also set up these facilities in clusters after coming into agreement with other ULBs on issues of operation and maintenance.

- The processing or recycling site shall be away from habitation clusters, forest areas, water bodies, monuments, National Parks, Wetlands and places of important cultural, historical or religious interest.
- The time frame for suitable site selection and implementation of C & D Waste Management facility is as per Schedule-I.

6. COLLECTION AND TRANSPORTATION OF C & D WASTE

Collection and Transportation of Construction and Demolition Waste shall be done by the Urban Local Bodies (ULBs) or by authorised private agency within two days of receiving information or complaint regarding generation of C & D waste. The following considerations shall be kept in mind while planning for Collection and Transportation activity.

- For small generators of C&D Waste (such as waste resulting from petty construction, repair or maintenance works), ULB shall consider two options, (a) deposit of C&D Waste by the small generators at collection centres/earmarked areas; or (b) removal of the C&D Waste by the ULBs through itself and/or authorised private party on payment basis. The fees for collection of C & D Waste by ULBs/authorised agency is defined at Schedule-II.
- Waste generators who generate 20 tons or more in one day or 300 tons per project in a month shall have to make every effort to segregate the C & D waste in different streams at their site and shall recycle and reuse the waste to the maximum extent possible. The fees for collection of C & D Waste by ULBs/authorised agency is as per Schedule-II.
- The waste generators shall inform to the Urban Local Body or the authorised agency in writing/ or telephonically within three days of generation of C & D waste for collection of such waste by paying the charges as mentioned in Schedule-II. The Urban Local Body or its authorized agency shall collect the C & D Waste within two days of receiving the information or complaint about the C&D waste generation. If information about the generation of waste is not given and the charges for collection are not deposited within 5 days of the generation of waste, a penalty of Rs 1500 per event shall be charged to the waste generators as per Rule-7 (xii) Schedule-II (Item No-8) of Solid Waste Management By-laws of respective Urban Local Body.
- For creating awareness about management of C & D Waste, the Urban Local Body shall carry out massive awareness campaigns and will also release public notice in at least two local new papers. The sample reference copy for releasing the Public Notice is annexed as Annexure-1.
- All ULBs shall publicise the rates for collection, transportation and storage of C&D Waste and shall publish such rates on their websites, offices, local newspapers and public places.
- The Standard Operating Procedure (SOP) for the entire collection and transportation process is given below:



7. PROCESSING OF C&D WASTE

Recycling of C&D Waste is essential because it reduces the dependence on natural resources and eliminates adverse environmental impacts such as mining for virgin materials. Recycling of C&D wastes also reduces the quantum of C&D waste resulting at landfills and open spaces. Additionally, under the C&D Rules, ULBs are required to make arrangements for the processing and disposal of C&D Waste, either themselves or by appointing authorised agencies.

Construction and demolition waste can be used in the following manner:

- Reuse (at site) of bricks, stone slabs, timber, conduits, piping railings etc. to the extent possible and depending upon their condition.
- Sale / auction of material which cannot be used at the site due to design constraint or change in design.
- Plastics, broken glass, scrap metal etc. can be used by recycling industries.
- Rubble, brick bats, broken plaster/concrete pieces etc. can be used for building activity, such as, levelling, under coat of lanes where the traffic does not constitute of heavy moving loads.
- Larger unusable pieces can be sent for filling up low-lying areas.
- Fine material, such as, sand, dust etc. can be used as cover material over sanitary landfill.
- Use as a granular sub-base (the layer above compacted earthen sub-grade) in road construction.
- Processed C&D waste (after sizing and sieving) can be used in road pavement for sub-base construction.

7.1. Utilisation of C & D Waste Streams

- **Reusing of C& D Waste:** It does not require any further processing to convert into a useful product. The items which are usable directly are screened out from the debris and put into the possible use without further processing.
- **Recycling of C&D Waste:** Once the waste generated from construction and demolition activities has been segregated and reusable items are taken out, the leftover is available for further processing i.e. recycling into next useful stage.

7.2. Machinery for Recycling

Once the structure is demolished as per the plan in an Engineering manner, use of appropriate equipment and machinery is essential in the recycling process. Such equipment may be jaw crushers, magnetic separators, vibratory screens, washing equipment etc.

The recycling plant consists of the following technologies:

1. Feed hopper
2. Pre Screening
3. Washing & aggregate cleaning
4. Trash Screen for removal of light weights
5. Sizing Screen for washed Aggregate
6. Hydro cyclone system for Sand washing
7. Water Management system for recycling of process water

Among the major & minor components of C&D Waste, the most unpredictable and difficult materials are clay (soil) and all types of floating materials like plastic carry bags, sachets, thermocol etc. Recycling Technology has provided the solutions to tackle these difficult materials and make C&D Waste an acceptable quality product for re-use.

The following products can be recovered from recycling:

1. Recovery of washed sand for construction
2. Recovery of 2-3 sizes of mixed Aggregates
3. RMC made with recovered material
4. Value-added products like Kerb Stones, Pavement Blocks and Concrete Bricks etc.

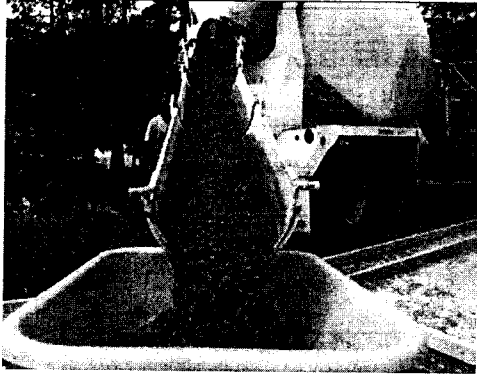
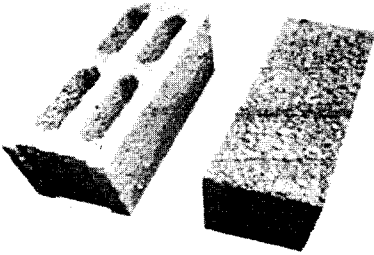
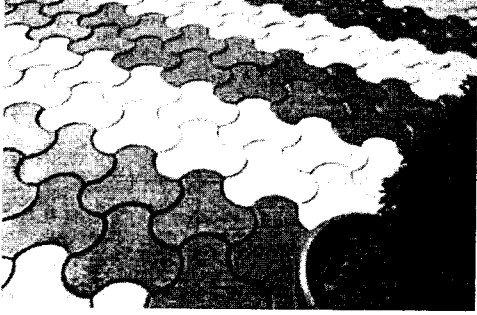
These products made from recycled material have been tested in various laboratories and found to be suitable for specified purposes. Today, these products are actually being sold in the market bringing extremely high return to the investor.

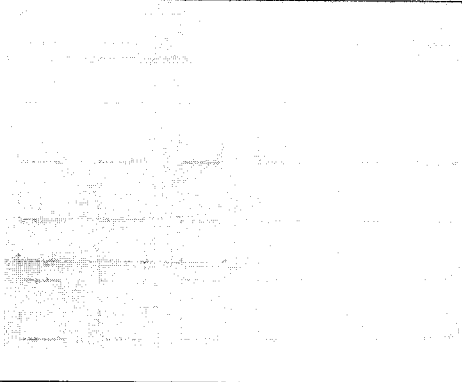
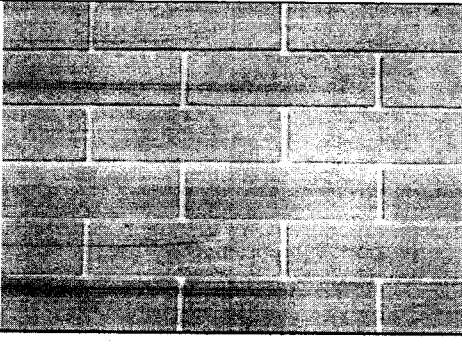
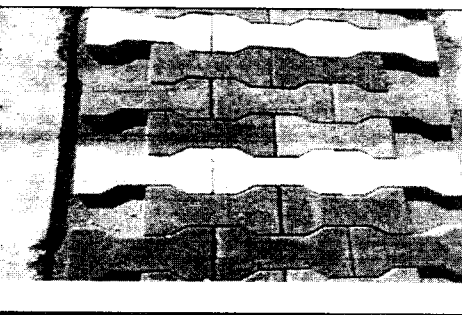
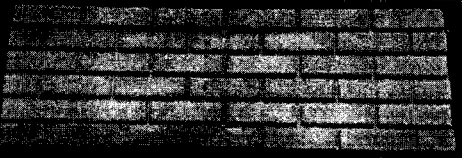
Given that the capital investments involved in equipment and facilities required for recycling C&D Waste are significant, development of the market for recycled aggregates is critical for economic viability of C&D waste processing facilities. The CPCB has stated that (i) the building construction products manufactured from C&D wastes have been reported to satisfactorily meet necessary requirements of compressive strength and water absorption; (ii) the end products such as kerb stones,

paving blocks, hollow and solid blocks, manufactured sand etc. have been tested in laboratories and found to be satisfactory; and (iii) use of fine aggregates and coarse aggregates manufactured by recycling of C&D Waste have also been validated scientifically for part replacement of natural aggregates. However, there is currently a lack of awareness and incentives among the stakeholders in the construction industry to use C&D recycled products.

7.3. C&D Waste Recycled Products & its Applications

Different Products obtained from C&D Waste Processing

Sl. No.	Product Name	Image specimen	Uses
1.	Ready Mix Concrete.		<ul style="list-style-type: none"> • Most versatile construction material. • Used in all kind of construction activities.
2.	Hollow Bricks		<ul style="list-style-type: none"> • Used in construction of buildings and houses, especially compound walls. • Provides heat insulation.
3.	Pavement blocks		<ul style="list-style-type: none"> • Parking Pavements. • Pedestrian Pathways • Passageway
4.	Tiles		

(i)	Chequered Tile		
(ii)	Brick Tile		
(iii)	Dumble Tile		<ul style="list-style-type: none"> • Pedestrian subways • Special effects in drive ways • Creative items
(iv)	Wall Tile	 <p>WALL TILE (220mm x 72.5 mm x 10 mm) Pieces - Per SQM (63) Composition - Cement (1) : Sand (1.61) : Aggregate (2.67)</p>	
(v)	Interlocking Tile	